APPENDIX III

ECONOMIC RELIANCE ON CRAB BY AFA SECTION 208 CROSSOVER VESSELS: IMPLICATIONS FOR SIDEBOARDS

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INTRODUCTION

Section 211(a) of the American Fisheries Act (AFA) requires the North Pacific Fisheries Management Council (Council) to "...recommend for approval by the Secretary such conservation and management measures as it deems necessary to protect other fisheries under its jurisdiction and the participants in those fisheries, including processors, from adverse impacts caused by this Act or fishery cooperatives in the directed pollock fishery." Subsection (c)(1)(A) further requires the Council, by no later than July 1, 1999, to "recommend for approval by the Secretary such conservation and management measures to "prevent catcher vessels eligible under subsections (a), (b), and (c) of section 208 from exceeding in the aggregate the traditional harvest levels of such vessels in other fisheries under the authority of the North Pacific Council as a result of fishery cooperatives in the directed pollock fishery." Such recommendations shall hereafter be referred to as sideboards.

The general intent of this report is to provide background information and analysis that may assist the Council in framing sideboards as they pertain to the North Pacific crab fisheries. This report portrays historical performance of section 208 crossover vessels that are also crab License Limitation Program (LLP)-Alternative 9 qualified. The purpose of such analysis is to identify likely behavioral motivations that underpin historical economic dependence--what has come to be referred to as "economic reliance". Comparable information was developed for Alternative 9 qualified vessels that are not defined by AFA as section 208 crossover vessels. This additional non-crossover information was requested by Dave Fraser during the April Council meeting. Discussion of this non-crossover analysis is limited to issues that may alter Council sideboard deliberations.

It is important to recognize that the concept of "economic reliance" has no formal definition in economic theory. What may seem to be reliance to one individual may be regarded as non-reliance to another. Accordingly, the analysis presented in this report will illustrate various perspectives of historical reliance; each may yield different impressions/insights into how important a crab fishery has been to a particular vessel.

APPROACH

The general framework is to contrast economic performance of the 258 vessels qualified to fish crab under the LLP-Alternative 9 with the 39 AFA section 208 crossover vessels that are also Alternative 9 qualified. Both sets of vessels were identified by Council staff at the December 1998 Council meeting. The following notation is used to distinguish between the crossover and non-crossover vessels. The 258 non-crossovers are labeled "NXO", while the 39 crossover vessels are labeled "XO".

It became apparent during the analysis that the 39 XO vessels required a subdivision. Each policy period had a few XO vessels that caught most of the opilio crab harvested by the XO fleet and, in fact, appeared to behave more like NXO vessels than XO vessels, at least with respect to opilio. These vessels were segregated into a separate category. The number of top opilio revenue earners among the 39 varied from year-to-year, but was never less than three. Accordingly, the segregated category was defined as the top three vessels. This segregation is intended to provide visibility for the behavior of the class of top performers.

Several levels of comparisons are made in this analysis. The most aggregate level compares the distribution of estimated fishery gross earnings by NXO and XO. The least aggregated comparison enumerates each of the 39 XO vessels, though reports performance in terms of percentages of gross revenue in all fishing activities or percentage of crab-specific gross revenue in order to protect vessel anonymity and comply with state and federal confidentiality requirements. Consistent with objectives of Section 211 *PROTECTIONS FOR OTHER **FISHERIES***, only revenues earned from fishing are considered in this analysis.

Each comparison is made for four different policy periods: 1997, 1996-97, 1995-97, and 1988-97. It is through this yearly differential policy perspective that different notions of economic reliance come into focus. The first three policy periods take different views of recent participation. The shorter the historical perspective, the more difficult it is to provide any insight into a meaningful notion of economic reliance because it provides limited or no insight into vessel motivation or behavior. Longer historical views provide more information to infer vessel motivation and thus, how or why Areliance@ changed over time.

For example, the single year, 1997, was potentially an anomalous year for discerning economic reliance; reconsideration of crab LLP was introduced at the April 1997 Council meeting (Agenda item C-4(c) Buyback Program; Industry Report), with Council decision to be made in Fall 1998. Behavior in 1997 may have been more representative of the policy incentive to Afish-for-rights@ as opposed to fishing for crab because this activity is an important contributor to XO vessel economic performance. A meaningful definition of economic reliance should be a function of behavior related primarily to economic performance and not solely a response to policy changes. A longer time perspective is essential to uncover what the underlying motivation may have been in 1997.

The fourth policy period takes a longer, 10-year perspective for one main reason. Unraveling the components of economic reliance requires examining a sufficient number of years in which there were no policy changes that could distort economic behavior. For example, the public was notified on September 5, 1990 (FR 36382) of the Council=s intent to develop measures to limit access to the groundfish, crab and halibut fisheries off Alaska. The Council subsequently defined 1991-94 as qualifying years under the original crab LLP. Specific qualifying years differed by crab species and, in some cases, area. These qualifying years conceivably could distort evidence of reliance for precisely the same fishing-for-rights reason that may have occurred in 1997. Furthermore, the Bristol Bay red king crab fishery was closed in 1994 and 1995, making the 1995-97 policy period potentially less informative in terms of vessel behavior than desirable, at least for red king crab. The 1988-97 period contains years in which there are no policy-induced behavioral incentives. In fact, this 10-year policy period guarantees that the number of years in which there are no potential policy distortions is greater than or equal to the number potential policy distortion years for all crab species. It follows that this 10-year period provides an opportunity to examine behavioral consistency outside the potential distortion years.

The analysis unveiled below will illustrate that the use of averages to represent meaningful policy information should be viewed with skepticism. Each policy period is examined working back to 1988. The analysis will show that conclusions drawn from each period may be misleading. As the analysis moves from policy period to policy period, some insights may be discovered, but sometimes at the expense of other distortions. The difficulty stems not simply from an incomplete view of history but from the use of averages and therefore, an inability to uncover behavioral motivation that strikes at the heart of economic reliance. It isn=t until a year-by-year perspective is taken (Figures 7, 8 and 9) that underlying economic motivations become clearer.

[1] Averages were calculated assuming vessels existed all ten years, 1988 through 1997. Accordingly, no distinction was made between Adid not fish@ versus Adid not exist@. Average revenues for vessels that did not exist in the earliest years would be understated.

Throughout the analysis, no attempt was given to reconciling changes in fishing seasons that may have contributed to changing behavior. This potential shortcoming may be of greatest concern prior to the termination of the JV pollock era, i.e., prior to 1991.

DATA

The analysis was conducted using a blend of CFEC fish ticket data, 1988-97, and federal data on offshore landings, 1992-1997. The CFEC data contains complete landings (round pounds) and gross earnings estimates for fish and shellfish landed onshore. It also contains complete offshore data prior to 1991 when fish tickets were required for fish landed in the U.S. EEZ. Offshore reporting/record keeping responsibility shifted to the federal government in 1991, though some vessels continued to complete fish tickets on at least a portion of their offshore landings.

Catch and earnings data (exclusive of roe bonuses) for non-crossover vessels came from the CFEC fish ticket files. Crossover data came from the CFEC files for crab and an aggregate Aother shellfish@ category, and from the blended federal and CFEC data for P. cod, pollock and an aggregate fish category, Aother finfish@. Unfortunately, several errors were found in the CFEC aggregated data that are embedded in this analysis because the errors were found too late to rectify. Other finfish in the offshore sector was defined by federal data as consisting only of Atka mackerel, yellowfin sole, rockfish and flatfish, whereas, all other finfish, including IFQ fish, were included in the CFEC data. The federal data contains only landings estimates. Corresponding gross earnings for fish landed offshore were derived by multiplying landings times an annual Bering Sea Aleutian Islands area exvessel price estimate for each species. Like the onshore data, roe bonuses are not included in the pollock price estimate. Accordingly, pollock gross earnings are understated, making the crossover vessels appear more dependent on crab revenues.

Anomalies were found in the federal data set during data verification. The CFEC offshore landings data were at best partial during 1991-97. The blended crossover data consisting of the complete CFEC data, less CFEC offshore landings, plus federal offshore landings, theoretically had to be greater than or equal to the original complete CFEC data set. This was not always the case. CDQ data were missing from the federal data and there were substantial irregularities during the pre-CDQ period. Accordingly, the final blended data set used in this analysis was compiled under the following protocol. Federal offshore data replaced CFEC offshore data if and only if the federal landings data exceeded the CFEC counterpart; else, the complete CFEC data was used. This protocol was implemented on a vessel-by-vessel, year-by-year basis. The result is a data set that accurately captures onshore landings (except for CDQ pollock) but which under-states offshore landings, especially in the pre-CDQ time period. The implication of this data deficiency is that it under-reports revenues from the XO fleet, making XO vessels appear to be more dependent on crab revenues. Likewise, inclusion of brown king crab under Aother finfish@ under-reports

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[2] CFEC inadvertently included brown king crab under the Aother finfish@ category rather than Aother shellfish@. This error overstates other finfish (understates crab earnings) by the NXO fleet. CFEC also reported CDQ pollock as other finfish, rather than as pollock. It follows that the XO earnings from pollock are understated.

[3] **Source: Exvessel prices in the domestic groundfish fisheries off Alaska by area gear and species, National Marine Fisheries Service office of the Pacific Marine Fisheries Commission.**

the NXO share of revenue from crab and over-reports its share coming from other finfish. The XO fleet was largely unaffected by the inappropriate categorization of brown king crab.

ANALYSIS

The analysis presented below focuses on three species of crab: red king crab, opilio Tanner crab, and bairdi Tanner crab. The other crab species examined include blue king crab and Korean horsehair crab. Neither of these two species are of economic importance to the crossover fleet. Initially, revenue performance is compared between NXO and XO vessels. Then, a closer examination of XO fleet activity is presented. Finally, comparative insights concerning the NXO fleet performance are made.

REVENUE COMPARISONS. Figure 1 provides the most aggregate view of fishery-specific performance. It compares the average revenue earned by fishery for a typical vessel in the 258-vessel NXO fleet, to a typical vessel in the 39-vessel XO fleet. The XO fleet was divided into two groups in order to illustrate the differential importance that crab can have on some of the XO vessels. The top three crabbing vessels among the XO fleet are labeled XO3 for each historical period, while the remaining 36 XO vessels are labeled XO36. Segregating out the top three crab producers should not be construed to imply only three vessels rely heavily on crab. The extent of economic reliance varies across years, as will be shown throughout the analysis.

Fisheries are aggregated in Figure 1 into four species designations: crab, pollock, other finfish, and P. cod (other shellfish was dropped because it accounted for only 0.1% to 0.5% of total income). The two graphs contained in this figure show the average gross earnings per vessel by species category and the percentage contribution of each species category to gross earnings. For example, in 1997, NXO vessels earned on average $620,000 in contrast to $1,680,000 for XO36, while XO3 vessels earned $1,469,000. Eighty-one percent of the NXO income derived from crab (exclusive of brown crab), whereas, crab accounted for less than 7% of XO36 income and 34% of XO3 income. The share of NXO income attributable to crab increases to more than eighty-eight percent when brown crab is included in the crab category, rather than in other finfish. The XO fleet is unaffected by CFEC=s inappropriate categorization of brown crab. With the exception of a single vessel in a single policy period (1995-97), each the XO3 vessels earned considerably less than the top XO36 vessels who typically target pollock in both the A and B seasons every year.

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[4] Differences in Aaverage earnings@ depicted in Figure 1, with notable exceptions, mirror the variation in gross earnings between NXO and XO vessels. For example, the active NXO fleet (exclusive of catcher-processors) earned a 10-year minimum of $1 million and a maximum of $27.5 million, while the XO fleet earned a minimum $4.4 million and a maximum of $26.1million. Note that Aminimum@ was defined for the NXO fleet as the fifth-lowest catcher over 60 feet. This very low minimum reflects LLP-Alternative 9 vessels that fished few of the 10 years and may have qualified by acquiring latent licenses, e.g., sunken vessel licenses. In contrast, all 39 XO vessels fished each of the 10 years. The maximum NXO revenue also is not very reflective of Ahighliner@ NXO earnings. The highest revenue NXO-catcher vessels specialized in both opilio and brown crab, an uncommon practice.

[5] In ten years, only two XO vessels ever landed any brown crab; one landed brown crab in two different years, the other landed brown crab in a single year. The 10-year cumulative brown crab earnings were just $52,000 for these two XO vessels.

The impression left by Figure 1: 1997 is similar to that of 1996-97, except that crab became more important to XO3 (crab=s share of revenue rose to over 44%) and less important to XO36 (dropped to 5%). The 1995-97 and 1988-97 historical perspectives change more dramatically. The XO3 vessels earned, on average, more total income than their XO36 counterparts in 1995-97, because they earned almost as much income from crab ($566,163) as the average NXO vessel. The 1988-97 period yields yet a different conclusion. All vessel categories appear to rely more on crab than in any other period. During this 10-year horizon, crab accounts for 85%, 9% and 69%, respectively, for NXO, XO36 and XO3. The average XO3 vessels even out-performed the average NXO vessel. The appearance of increased economic reliance as the historical perspective elongates may be somewhat illusory. Each of the time periods contains behavioral incentives that must be understood in order assess the level of Areliance@. The 1988-97 time period, for example, contains all years in which the behavioral motivation could have been fishing-for-rights. It also contains all years in which crossover participation in a particular crab fishery could have been motivated by high-expected revenues. And crab income during these high-expected revenue years may have been sufficiently large for just a very few number of vessels that the XO36 sub-fleet average was pulled up. These apparent motivations and anomalies can be uncovered by systematically examining XO performance in each of the crab fisheries.

Figure 2 shows the percentage distribution of crab revenue for NXO and all 39 XO vessels. In 1997, 83% of the XO-crab revenues were derived from red king crab. The remainder came from opilio, even though only three XO vessels fished opilio. The NXO fleet, in contrast, derived most of its income (70%) from opilio; only 20% came from red crab.

Comparing 1997 with 1996-97 would seem to suggest that there was not much structural difference between these historical periods, i.e., the underlying fishing behavior seemed to change little during the two years. In fact, this conclusion is not correct. Thirty-eight XO boats fished red crab in 1997 when LLP was being reconsidered; only nine fished in 1996. One might think that the red crab share of gross revenues would fall dramatically when, in fact, it only dropped from 83 to 75%. This slight drop is a consequence of total XO revenues falling, as well.

The first striking change in the XO crab portfolio is apparent by contrasting 1997 with 1995-97. Opilio took on a more prominent role than red crab for XO vessels. Red crab=s share for a so-called Atypical@ XO vessel dropped by nearly half, while opilio=s share increased nearly three-fold (17 to 47%). This apparent change is misleading for two reasons. First, only 9 XO vessels fished opilio in 1995--twice the number of XO vessels that fished in 1996 and three times the number that fished in 1997. Second, 1995 alone accounted for more than twice the industry-wide opilio gross revenues of 1996 and 1997 combined, $180 million versus $85.6 million and $92.5 million, respectively (see 1998 Crab SAFE document, Table 5-28). This greater share of a larger sum of money was distributed across all 39 vessels (which defines a Atypical@ vessel). But this limited participation and large variation in gross earnings across years belies Atypical@. No significant behavioral changes really occurred in this policy period, despite the appearance of change.

The 1988-97 historical perspective in Figure 2 is misleading for similar reasons. All LLP qualifying years are included in the XO average performance and all atypically high gross earnings by a small portion of the XO fleet are incorporated.

DETAILED LOOK AT XO FLEET. Figure 3 provides a more detailed examination of individual XO vessel performance because it reveals the vessel-by-vessel distribution of total revenue. Red king crab appears to play a **relatively** consistent role in the XO fleet income. However, it is important to keep in mind that 38 of the 39 XO vessels fished in 1997, while only nine fished in 1996. This difference appears to be due to the fact that 1997 was a LLP qualifying year, i.e., the high participation rate was induced by a policy incentive to fish-for-rights. Pre-season expected gross earnings (price times GHL) were nearly identical ($20 million in 1996 versus $22.8

million in 1997). Both were years of low expected earnings, so, the high participation rate in 1997 cannot be attributed to greater expected earnings potential. Some have argued, however, that entry into a crab fishery is driven by GHL rather than expected income. If correct, the low GHL in 1996 (half that of 1997) may explain the low XO participation rate. But if participation is not motivated by economic considerations, the entire question of economic reliance is moot, as is the argument that fleets need to diversify to mitigate revenue volatility.

Red crab revenues as a share of total revenues dropped across the XO fleet in 1995-97 policy period because the Bristol Bay fishery was closed in 1994 and 1995. The 10-year policy horizon shows red crab revenues as a share of total revenues rose nearly to the 1997 level. This increased contribution to red crab is attributable to three additional LLP qualifying years, 1991 through 1993. Interestingly, the highest two expected-income years, 1989 and 1990 generated very little red crab effort by the XO fleet, five and 12 vessels, respectively. End of the JV era probably explains low participation in 1989, but not in 1990. The 1990 pollock fishery ended two weeks prior to the red king crab opening**Y**adequate time to change fisheries. Details surrounding the role LLP may have played in determining XO participation versus the role of expected revenue will discussed later.

Caution is still warranted when inferences are made because three of the four-Figure 3 graphs average across years. There clearly is a wide range of dependence on red king crab for revenue. The greatest variation between XO vessels deriving the lowest and highest share of revenue from red crab occurred in the last LLP qualifying year, 1997, when red crab accounted for as little as zero and as much as 18% of total revenues for an individual vessel. Comparing the distribution of total revenue across years seems to suggest some vessels **A**relied@ on (*sic*, earned a substantial share of their income from) red crab. This inference is only partially correct. Vessels are sorted in Figure 3 from largest to smallest share of income due to red king crab, i.e., vessel ordering changes across time. A vessel that earned a large percentage share of income from red crab in one historical period may have earned a lower share in a different period. Moreover, the **average share** in 1996-97, 1995-97 and 1988-97 is partially a reflection of participation in just a few years.

Figure 4 provides additional insight into the distribution of crab revenues across time. In 1997, only red king crab and opilio were landed by the XO fleet, and only three of the vessels landed opilio. One additional vessel landed opilio in 1996, and ten vessels landed bairdi. Some of the bairdi was bycatch to red king crab fishing in 1996. The 1995-97 period shows that about one third of the XO fleet derived significant crab earnings from bairdi and opilio. This change in performance relative to subsequent years is due exclusively to 1995 fishing behavior. Opilio (and bairdi) garnered an even greater share of XO crab revenues in the 10-year scenario primarily because of policy-induced entry (and increased bairdi participation during qualifying years) combined with the very high value of the opilio fishery during 1991-95. Nevertheless, all crab accounted for a relatively minor share of gross earnings for most XO vessels.

Figure 5 illustrates the significance of the top three XO crab vessels in terms of their share of opilio revenues, the big money crab fishery. In 1997, only three XO vessels landed any opilio at all. This share slipped to 90%, 63% and 61%, respectively in 1996-97, 1995-97 and 1988-97. The reason the 1995-97 share for XO3 slipped is because 1995 was a high-expected revenue year for opilio. Even so, only nine XO vessels participated in the 1995 opilio fishery, several after the A-pollock season ended. Participation by these nine vessels represents a three-fold increase over the 1997 participation rate and more than double the rate of 1996. That increase in vessel participation, combined with much greater earnings, markedly decreased the relative importance of the top three vessels. The 1988-97 historical period was similarly influenced by five years of high-expected earnings and, coincidentally, three LLP qualifying years. Again, annual participation remained low, peaking at 14 vessels in 1994. Perhaps the most important issue to be gleaned from Figure 5 is that few of the crossover vessels

consistently garnered much of the opilio earnings. The sideboard policy significance of this issue will become clearer when annual participation (Figure 8) is discussed.

Figure 6 provides further detail concerning the relative importance of the opilio fishery to crossover vessels. This figure shows opilio as a share of total revenue for 39 XOs. Several conclusions deserve amplification. First, it is clear that some vessels derived a substantial portion of their income from opilio, others derived little income from opilio, but the majority never relied on opilio. Second, those who fished opilio occasionally or who earned a relatively small fraction of their total income from opilio, typically did not target opilio instead of A-season pollock. Rather, they tended to finish the A season and then, turned to opilio, especially in years with long opilio seasons. The important sideboard inference is that XO vessels freed up under a cooperative are most likely to have adverse economic impacts in the opilio fishery for two reasons. First, this is the highest value crab fishery and it is underutilized by most of the XO fleet– all of whom are LLP qualified for opilio, primarily through a general Tanner crab qualification. Second, if the XO fleet were capped at its historical level by a fleet-wide cap, only two to five XO vessels caught most of the opilio because they routinely targeted opilio, often instead of A-season pollock. Depending upon how an aggregate crossover cap is applied, these few vessels could be severely damaged by other XO vessels freed up under an AFA cooperative.

As usual, care is warranted when drawing inferences across multiple-year scenarios. Each of the historical periods portrayed in Figure 6 reflects average XO performance across the specific years. This averaging over-states **annual** participation. For example, the 1988-97 period seems to suggest 24 different vessels participated, when in fact the correct interpretation is that 24 **different** vessels participated **at least** one of the 10 years. The maximum number of vessels to participate in a single year is 14; the minimum number is three.

Figures 7, 8 and 9 show the year-by-year participation of each XO vessel, which provides the behavioral insights that simply are not available from the various averages contained in Figures 1-6. These behavioral insights will help clarify the concept of economic reliance.

All three figures identify individual vessel participation by LLP qualifying and non-qualifying years for the entire 10-year period. The vessels are ranked from the highest to lowest number of participation years, summarized in the far right column. Three other features are contained in this graph. The second to last row summarizes the total number of vessels that participated in a particular year. The last row indicates the preseason expected revenue measured as price times GHL. The years of high-expected revenue are highlighted. Bristol Bay red king crab closure years (1994-95) and the bairdi closure year (1997) are also highlighted.

Figure 7 reveals that most participation in the red king crab fishery appears to be motivated by qualifying for LLP. Of the 39 XO vessels, 30 to 38 fished in each of the four qualifying years (1991-93 and 1997). The maximum participation in non-qualifying years ranged from as little as three to at most 12 vessels.

High-expected revenue did not contribute to a high participation rate, i.e., revenue does not appear to be the motivational force underlying red king crab participation. Only five and 12 vessels participated in the two high-expected revenue years, 1989-90. It also appears that red king crab participation is not generally motivated by a portfolio strategy, which is exemplified by routine participation in a fishery. Vessels routinely participate in several fisheries in order to minimize the risk of revenue volatility or because they systematically rely on the contribution of several fisheries to overall income. Few of the XO fleet **consistently** relied on red king crab as part of their overall fishing portfolio. Just over a third of the XO fleet fished red king crab five or more of 10 years (eight years that the Bristol Bay fishery was open); only seven of 39 XO vessels fished at least six of the 10 (eight) years.

Figure 8 tells a different story about opilio. Regardless of any motivational factor, participation was low in all years, ranging from three to 14 vessels. Participation was, however, highest for the intersection of high-expected revenue years (1991-95) and initial LLP qualifying years (1992-94), making it difficult to discern which of these motivational factors is more important. It would appear that there is a limited but important portfolio effect with up to five vessels, at most. One vessel fished all 10 years, one fished eight years and three fished five years. The remaining 34 vessels fished three or fewer years during the 10-year period; 15 never fished opilio at all. But are still opilio qualified under the general Tanner crab LLP.

Figure 9 illustrates the pattern of participation in the bairdi fishery. First, it is important to note that only a single vessel qualified for a general Tanner crab endorsement because of bairdi bycatch landed during the 1993 red king crab fishery. Second, participation *appears* to be motivated less by LLP than observed with red crab. While most participation in the bairdi fishery still occurred in the first two of three qualifying years (1992 and 1993), two non-qualifying years (1991 and 1995) also were years of high participation. High participation in 1991 (24 of 39 vessels) is probably due to a symbiotic relationship between Bristol Bay red king crab and fall bairdi fisheries. The first LLP qualifying season for red king crab (1991) ended seven days before the bairdi season opened. There is no obvious explanation why 19 of 39 XO vessels fished in 1995, a closure year for red king crab and a year of low expected bairdi income. Participation in the next year, 1996, once again emulates that of the Bristol Bay red king crab fishery, when only half as many XO vessels fished bairdi in 1996 compared to 1995¢ one more vessel than fished red king crab 10 days earlier.

INSIGHTS FROM NXO. An identical analysis was conducted for all NXO vessels at the request of an Industry Advisory Panel member. Figures 3, 4, 6-9 were replicated for NXO vessels. Little additional policy insight was gleaned from this exercise, so, the additional 15 figures are not appended to this report. Not surprisingly, NXO vessels derive a much greater portion of their income from all crab species. Three noteworthy issues were uncovered, however. First, the NXO vessel list contains at least two vessels that either purchased latent licenses or that may not qualify under LLP-Alternative 9. Second, 10 of the remaining 256 vessels (excluding exempt vessels under 60 feet) typically earn more income from fish than from crab. This observation is not surprising given that the NXO classification is defined as: a) NOT a section 208 vessel and b) LLP-Alternative 9 qualified. NXO vessels are not necessarily Atrue@ crab vessels, though the vast majority are. Third, participation rates across crab fisheries differ dramatically between the NXO and XO fleets. This one comparison could be of sufficient policy merit that it warrants discussion.

A comparison of Figures 7-9 with their NXO counterparts is summarized in Figures 10-13 because each NXO figure requires six pages to enumerate all 258 vessels. The most notable contrast is the absence of fishing-for-rights among most of the NXO fleet. The frequency of NXO fleet participation is much more consistent, regardless of fishery. Nearly 80% of the NXO fleet fished for red king crab at least six of ten years, more than four times the corresponding participation rate of the XO fleet. The XO participation rate in red crab fisheries equalizes that of NXO at about four yearsY exactly the number of qualifying years. This observation further suggests the fishing-for-rights motive dominated XO behavior in red crab. The disparity between NXO and XO is much greater for opilio. Only 5% of the XO fleet fished opilio at least six of 10 years and only 13% fished at least half the ten of years. In contrast, 78% of the NXO fleet fished opilio six of 10 years; 83% fished at least half the number of years. The NXO participation rate in bairdi was more than three times that of XO for vessels that fished at least six years (72% versus 21%) and 2.6 times greater at five or more years (81% versus 31%). Participation by the two sectors equalized at a mere two years. These comparative results are even more

[6] Expected revenue is not included in Figure 9 because the annual bairdi fishery was split into two seasons for several years.

dramatic when one realizes that several of the NXO vessels tend to specialize in brown king crab, while 10 of the NXO vessels focus more on fish than crab.

CONCLUSIONS

The question of economic reliance can now be brought into focus. Economic reliance is a composite of three motivational factors: 1) a portfolio effect in which routine/consistent participation occurs either for added income or to lessen risk in a vessel=s fishery portfolio: 2) opting to enter a fishery in order to take advantage of high expected returns: and 3) policy-induced entry to secure the opportunity to fish a particular species at a future date, i.e., fishing-for-rights. All of these are legitimate dimensions of economic reliance. Which ones are more important for sideboard policy consideration is a question left open.

The above analysis demonstrates that crossover behavior differs in the two most important crab fisheries, red king crab and opilio. Entry into red king crab fisheries is dominated by what appears to be policy-induced fishing-for-rights, though there is some portfolio effect but little expected revenue-induced entry. Entry into the opilio fishery is less clear cut, though motivations seem less important because of the limited number of crossover participants. At most five crossover vessels can be construed as using opilio as part of a portfolio; a maximum of 14 and a minimum of three vessels fished in a single year.

If the Council is to consider economic reliance in setting sideboards for the various crab fisheries, the most important dimension probably is the portfolio effect. It is this behavioral motivation that identifies the vessels who stand to lose the most, i.e., those who have consistently utilized crab. Most of these vessels derive a substantial portion of their gross earnings from crab, and in some cases, may even use crab as the dominant source of income. However, it is critical to recognize that percentage of income from crab is not the essential litmus test in a portfolio context(participation frequency is. Vessels that consistently fish a particular species of crab may utilize crab more as a risk hedge, even though it may be a relatively minor income source.

Opportunistic behavior, i.e., targeting crab in high expected income years, probably is the second most important consideration in economic reliance, if only because it is a pure economic motive. Policy-induced motives (fishing-for-rights) ranks third. The principal economic interest underlying this behavior would seem to be a desire to preserve future opportunities, including the opportunity to participate in any future IFQ program.

Adherence to any of the three manifestations of economic reliance is likely to eliminate many XO vessels from the future opportunity to crossover into the opilio fishery. If any reliance criterion other than fishing-for-rights is used in sideboard formation, many vessels will be eliminated from red king crab. Few vessels demonstrated any opportunistic use of red crab by targeting high expected income years and few consistently fished for red crab or bairdi in non-qualifying years. Short of looking to specific economic reliance motivations as a basis for defining sideboard policy, the Council may wish to consider a threshold number of participation years.

How sideboards are implemented will be as important a policy consideration as whether economic reliance should be a basis for sideboards. For example, limiting the XO fleet to its aggregate historical catch could be implemented by limiting each vessel to its historical share of total catch. Alternatively, a fleet-wide cap could be instituted. Both methods limit the XO fleet to its historic aggregate share of crab.

The fleet-wide cap, however, could cause severe economic hardship to vessels within the XO fleet, especially in the opilio fishery. Two vessels historically relied on opilio for nearly half their income, year after year. These vessels behaved more like true crabbers than pollock vessels; one fished opilio instead of A-season pollock in each of the 10 years, the other did so in eight of 10 years. Three other vessels landed opilio five of ten years. A fleet-wide cap would allow the remaining 34-37 XO vessels to compete for the aggregate cap that two to five vessels created. Sideboard protection for these few XO vessels may be worthy of consideration if sideboards are implemented with an aggregate cap.

The alternative of individual vessel sideboards has its own set of issues. Non-stackable, vessel-specific caps may make fishing some crab species uneconomic for a subset of the XO fleet with little history in the sideboard qualification years. Vessel-specific sideboard caps also may create a management problem because the caps will serve as a type of individual fishing quota in what otherwise is a license-limited open access fishery. Individual caps may also provide an incentive to highgrade for those vessels that lack sufficient quota to participate the entire season.

One final issue concerning crab sideboards may be worthy of Council consideration. It is apparent that the NXO LLP-Alternative 9 vessel list contains some vessels that never landed either fish or crab, that landed crab infrequently, that mostly landed fish, or that now fish crab in Russia. Each of these situations is a variant of the latent license issue that could manifest an AFA spillover problem if licenses are tradeable from NXO to XO. For example, a crossover vessel that was not endorsed to fish in a particular crab fishery conceivably could purchase a latent NXO license to participate in crab fisheries in excess of either the XO fleet-wide or vessel-specific Ahistorical aggregate share@. Similarly, a crossover vessel freed up under AFA fishing cooperatives conceivably could harvest more crab than harvested by the prior NXO license owner. Purchase of latent licenses could impose external costs on the NXO fleet.

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[7] To complicate matters, the vessel that fished opilio eight of ten years targeted A-season pollock in 1996 and 1997. This is why Atwo to five vessels@ are responsible for creating the most of the XO opilio history. See Figure 8 for participation detail.